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FINKTEAM BORG

One of the world's finest speakers gets the full Colloms assessment, and he very much likes what he hears. Resistance, it seems, is futile

FinkTeam Borg

THIS UPMARKET FLOORSTANDING LOUDSPEAKER SYSTEM IS DESIGNED AND BUILT BY THE TEAM BEHIND FINK AUDIO CONSULTING. HERE IT'S ANALYSED BY MARTIN COLLOMS

HIFICRITIC AUDIO EXCELLENCE

Ed note: This unusual loudspeaker presented Martin Colloms with some additional challenges which he seeks to address in this extended feature review

This latest *meistewerk*, nay brainchild, from German loudspeaker system designer Karl-Heinz Fink is called Borg. This and an earlier and rather larger three-way, limited production design called the WM-4 (because it looked like a washing machine!) were both shown this year at the 2019 High End Show in Munich, where I spent some time auditioning them. I was sufficiently intrigued to ask for review example of the smaller version. Andrew Everard has already scouted FinkTeam and the Borg related research on their home ground last year (HIFICRITIC Vol. 12 No 2 April June 2018 pp 42-44) focusing his attention on the work of Karl and his team.

The Fink Audio Consulting design house is based in Essen and is behind many designs of highly rated 'own brand' loudspeakers, including many in the UK. These cover a very wide price range from the low hundreds to many thousands of pounds a pair. With the emphasis on collaborative research the complex technical design issues are the responsibility of the entire team, while UK specialist Keiron Dunk is frequently called upon to finesse the industrial design and final finished appearances. So when the company decided to make and sell its own speakers, FinkTeam was the obvious choice of brand-name.

First and foremost, Karl is a loudspeaker *system* designer, conceiving the overall product and equipping it with an appropriate level of technology for a given market position and performance. But he also closely specifies the overall engineering content. Here his specialist subject is the electronics, especially the crossover networks, but he's also closely involved in all aspects, including the multi-parameter global transfer function which helps to define and optimise sound quality. He has invested heavily in a custom sound room for the subjective analysis of stages in design while the facility also has both reverberant and anechoic environments for critical acoustic measurements. And not least he is something of an enthusiast, exhaustively exploring the behaviour of connected systems, of audio component matching, room acoustics, digital audio and the like, striving for optimal transparency, overall fidelity and that elusive quality of musical communication. Other team members – skilled in enclosure modelling, electroacoustic design and drive unit engineering – support the overall objectives, while at FinkTeam nearly all aspects of a loudspeaker can be prototyped to working examples, almost from the raw materials, and for the company's clients that service extends all the way through to production.

Borg is a substantial floorstanding loudspeaker of uncompromising outline, with geometry designed to allow radiated sound to flow smoothly over its impressive form, such that the overall output is radiated more coherently, with much reduced diffraction. Such diffraction anomalies are invisible to the eye but are calculable as secondary sound sources which exist at shape discontinuities such as sharp edges, and which sources interfere with the primary forward radiated sound. We have seen more of this valued preventative work in recent designs, while classic expositions include the Avalon loudspeakers, particularly the Eidolon series.

Standing just over a metre tall, Borg is a modest 0.3 m wide, is 0.4m deep and weighs a substantial 52kg, or 114lb. Floor-coupling is via key adjustable stainless-steel spikes, with the alternative of small steel domes for hard floors. Electrical connection is via well-spaced heavy duty Mundorf copper/gold plate binding posts, also with 4mm sockets, and it may be bi-wired. (jumpers not supplied). Fink actively supports biwiring at this quality level, indicating the use of costly sets of performance matched cables. Each loudspeaker came packed in a custom-made heavy-duty plywood 'coffin'; each lid is attached with eight machine screws and it is fitted with straps to aid lifting.

Away from the walls

Designed for free space location, i.e. away from the front and side walls of the listening space, Borg will drive larger rooms, e.g. up to 80m^3, supported by an estimated music power rating of up to 200W/channel. Here the calculated sound level in the typical larger room of 80m^3 could peak at a substantial 105dBA for a stereo pair.

MARTIN COLLOMS

The sensitivity is a modest 87dB/W, and for medium and large rooms amplifiers in the range 75W to 200W/ch. are advised to get the most from this design. Interestingly, it has the potential to improve the sound quality of both your amplifier and your loudspeaker cables by virtue of its kind 10 ohm nominal impedance, so drawing lower peak currents. This only falls to a very mild 6.5ohms by 20 kHz, by which frequency the music spectrum power is in any case naturally diminished, meaning that its amplifier loading compares most favourably with the trend for low impedance speakers, falling even to less than 3 ohms. This is often used to makes speakers a bit louder on demonstration, but frequently compromises sound quality. Both valve and transistor amplifiers may be considered to drive Borg, though perhaps not smaller single-ended triode types rated under 10W.

Technical Design

Fink describes the design and technology of this loudspeaker in uncompromised detail, with much of this information to be found on the Finkteam website. Borg is a serious and powerful two-way design with a 260mm/10.25in die-cast frame mid/bass driver, designed for a critically damped, extended low frequency alignment. This is augmented moderately by bass reflex loading, the output tapering with reducing frequency for an advantageous room match and better subjective timing. The tuning is designed to blend sympathetically with increasing room gain at progressively lower frequencies, and low coloration.

While it's uncommon, if done right a bass reflex may indeed sound clean, agile, have extended bass and benefit from the concomitantly improved dynamic range. To this end the Borg system is tuned to a low 37Hz port frequency at low Q, so that the -6dB point comes in at a higher frequency of 43 Hz, and with a moderated roll-off to the 34Hz effective limit. This approximates to a good sealed box alignment but with greater power handling, and further extension to 30Hz with typical room gain.

The port is generously dimensioned, and near impossible to overload. The dominant length pipe mode is addressed by a critically damped secondary anti-resonator realised as a circumferential slot leading to a fibre-loaded subchamber, the slot positioned along its length at the dominant mode location. The strongly flared port confers substantial power handling, and I detected no port overload distortion, on test or in use.

Focusing on the larger than usual planar 'ribbon' tweeter's extended range, the customary crossover point of around 3kHz has been brought down to

The Borg control panel and terminals

1.6kHz, to blend acoustically with the mid/bass driver, also larger than usual and of extended range. Fink explains that this 260mm driver has a light-weight, critically contoured paper pulp cone with two further features familiar to driver enthusiasts more focused on more natural dynamics – namely a thermally stable, oversize 75mm/3in diameter voice coil and a classic pleated, doped, triple roll surround-suspension similar that pioneered by Altec in the 1950s.

This surround design inhibits secondary suspension resonance, improves efficiency and better terminates the perimeter of the vibrating cone at higher frequencies. The ultimate throw or excursion may be a little less than the more usual half-roll surround, but the midrange impulse/transient response is superior. In fact, with this vented low frequency alignment the mid/bass driver moves very little, especially at higher midrange frequencies, resulting in negligible intermodulation.

More natural timbres

With a huge ceramic magnet, the driver motor includes a generously dimensioned aluminium shorting ring on the centre pole to greatly reduce voice coil inductance variation with position, and to reduce flux variation or modulation as a function of voice coil current. By suppressing third harmonic and higher frequency odd-order products, these features act to reduce subjective distortion, here aiming for more natural timbres and improved transparency, particularly at higher sound levels. Minimising those distortions to which we are aurally sensitive is key to this design.

What's more, when it comes to directivity, a 260mm piston driver such as that used here, crossing over at 1.6kHz, is comparable to a ubiquitous 130mm mid driver crossing over at 3.2kHz.

The System
Krell *300i*, Townshend *Allegri+,* Audio Research *REF6* control units; Naim *NAP500DR* power amplifier, Audio Research D160M monoblocks, Linn *LP12* player with *Keel* chassis and *Radikal* motor control, Naim *Aro* arm, Lyra *Delos* Cartridge, Naim *Superline DR* phono pre, *UnitiServe* and *UnitiCore* network server and S/PDIF source; NAIM *ND555 Streamer-DAC, with 555 PS(DR)*, Meridian *200* CD transport, Wilson Audio *Sasha DAW*, Sonus Faber Sonetto *VIII* , KEF *R5*, Magico *S-5II*, Quad *ESL63* , BBC *LS3/5a* (15ohm) speakers; Naim *FRAIM* and *Artesania* audio racks; Transparent XL *MM2* , Crystal *Ultra Diamond*, and Naim *NAC A5* speaker cables, Naim *Super Lumina,* Transparent *MM2* and Van Den Hul *Carbon TFU* interconnect cables.

Borg is specified as a genuine 8 ohm amplifier load, held quite uniform from 30Hz to 20kHz, and is typically a still kinder 10 ohms, despite momentarily dipping to 6.4ohms at 37Hz (this the well damped port tuning frequency) and also to a modest 6.4ohms at 20kHz, (where in any case music power demands are falling). Valve and transistor amplifiers will have no argument with such modest load current demands, and a further benefit results: cables and loudspeaker connections are also known to sound better at lower currents, here working with less loss and lowered distortion.

For the complete system Fink claims a high precision primary axial frequency response, 80Hz to 12kHz, here aiming for very tight +/-1.5dB limits. A slightly wider and more conventional +/- 2dB tolerance on the reference axis, indicates a promisingly wide frequency range extending from 55Hz to 35kHz. (most rival commercial designs are typically specified for wider +/-3dB tolerance). To hold such tight tolerances the production quality control needs to be top notch (see test results).

Fink is well aware that the power response, the overall sound energy from a source which will be directed into room, may be more important than the classic parameter of axial frequency response, which is merely cosmetic in many loudspeaker systems. A 'flat' axial response may conceal a multitude of sins off-axis – and frequently does – but the Borg design aims for a classic power response objective, one falling smoothly with increasing frequency.

Low third harmonic distortion is a benefit of the large area AMT tweeter, co-designed with Mundorf, and here measuring 90 x 26mm, with a 6464mm^2 radiating area –much greater than the 530mm^2 of the customary 26mm dome. The effective air coupling – and thus equivalent excursion – is also rather greater, thanks to the multiplying function of the 'air motion' bellows principle. Conversely the radiation angle in the vertical plane will be rather narrower than the usual smaller dome and consequently the room acoustic will sound drier in the upper frequencies, meaning the listener's head height will also matter more than usual.

An insight given by high resolution swept tone distortion measurement during development helped Fink and Mundorf to further refine the performance over the standard item. Another benefit is the almost resistive nature of the electrical load from the AMT, which improves the accuracy of the crossover network filter functions.

With these low distortion, low noise electronic components and drivers, clearly the enclosure needed a matching low noise character. Here the design emphasis is on the control and damping of panel resonances. It's impossible to force all the panel bending resonances above the audible range by increasing thickness and stiffness, so instead here they're highly damped to reduce their vibration amplitude and thus reduce their unwanted acoustic output, hopefully to below audibility.

This concept of the 'silent cabinet' is a major part of the way Fink and his team design speakers, and seen in some of his past client commissions, such as those for Q Acoustics: here it's achieved using a multilayer construction in MDF that combines varying thickness panels with special damping layers, in which high internal friction efficiently converts resonance energy into inaudible heat.

FinkTeam employs COMSOL high tech modelling, combined with laser scanning, to predict and model cabinet radiation behaviour and help position strategic clamps and braces. Such computer modelling also helped target optimal material thicknesses, the data of course backed up by exhaustive subjective assessment.

Despite all this effort during development, a mild coloration was heard from the prototype, and was found to be associated with the bass driver mounting. Internal reinforcement of the relevant enclosure aperture with a substantial brace ring of machined aluminium alloy proved to be the solution.

Some scope for tuning
Loudspeaker designers increasingly include user adjustments for low frequency damping and frequency response, to facilitate a better match to audio systems and rooms, but often such measures are afterthoughts. As is the case in other recent Fink creations, however, such adjustability is here inbuilt from the start, with sophisticated crossover and system design the key. By by adopting two larger, higher sensitivity, higher impedance drive units, significant user adjustability may be provided without compromising either amplifier or cable loading.

This includes finely judged bass damping selection, plus further 'tone' controls to facilitate fine-tuning of the loudspeaker. The bass control optimises the low-end to match damping factor (output impedance) variations in amplifiers, and can also account – at least partially – for room losses.

Its three settings cover (1) low impedance transistor amplifiers, (2) powerful tube and classic amplifiers, and (3), lower negative feedback valve/tube designs with an inherently higher output resistance. The last will be unsuitable for transistor amplifiers, perhaps showing some loss of bass 'speed' in normal rooms, but may nonetheless be helpful for use in very large rooms, here providing some useful low bass boost.

Allowing fine tuning of timbre – or more strictly 'attack' or perhaps 'immediacy' – is a control centred on 2.5kHz, acting over just about an octave bandwidth and with three very subtle settings: +0.25dB, 0dB, and – 0.25dB. A further midrange level control, centred on 850Hz and about two octaves wide, has no less than six exceptionally subtle steps of 0.15dB. These could be said to micro-tune subjective 'punch' and dynamics.

In addition, the treble above 3kHz may be trimmed by plus or minus 0.4dB in three steps. My initial assessments were made with all settings set to flat (namely the design target), optimising listener and loudspeaker locations, and with a mild 5 degree toe-in, before experimenting with these controls.

FinkTeam 260mm die-cast frame bass-mid driver, with a doped accordion surround-suspension, a low mass, coated pulp cone with large centre cap radiator, all these acoustical elements computer modelled

Local specialist supplier Mundorf designs and manufactures the majority of the high-quality crossover components specified by Fink for the 24dB/octave slope, Linkwitz-Riley crossovers. For the low frequency crossover section KFH has rejected the conventional wisdom of near zero series resistance for the essentially mandatory inductor:, such low resistance is usually contrived for maximum theoretical damping factor, and is classically a design given for most two- and three-way loudspeakers.

By eschewing the customary ferromagnetic iron or ferrite core there will now inevitably be some significant series resistance in the lead bass inductor. Accordingly, the bass-mid driver and enclosure alignment are computed to include this near zero-distortion air core inductor, but now with allowance also for some additional variable resistance element providing a subtle user adjustment for power, damping and attack in the low bass.

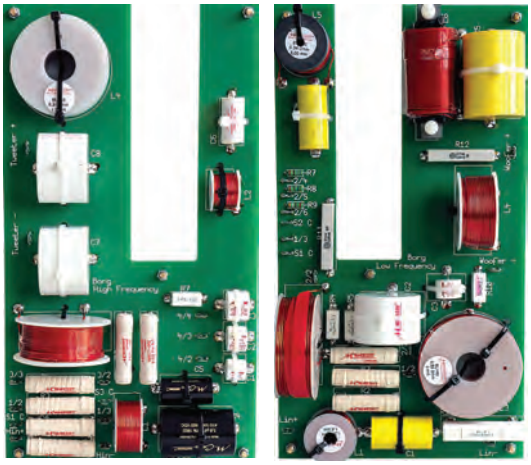
The midrange level control is achieved by facilitating a small bypass current across the mid/bass series inductor, employing resistor selections: by this means the loudspeaker may better account for the use of different amplifiers and various room situations. Blending the ribbon with the large mid/bass unit needed careful control of frequency and phase, and thus the upper crossover employs what is technically an L-R fourth order all-pass network, with rapid 24dB/octave roll-off slopes.

The user adjustment of 'presence' is made using small capacitors selected in parallel with the main series capacitor, while treble 'level' is worked via a dominant resistor together with smaller shunt values, and these may be switch selected.

By this means the switch is only partially included in the signal path minimising signal quality losses. For this section the components used are predominantly air core inductors working with Mundorf Supreme polypropylene film capacitors, plus selected low inductance wire-wound resistors, as illustrated below.

Connections

The heavy duty Mundorf 4mm/socket binding posts, of gold plated solid copper, are fitted with good clearance for firm finger tightening. No jumpers are present to aid single wiring, so I used 1.2mm insulated jumper wire in pure silver.



The complex crossover includes user adjustability via those rear panel switches. It employs through-hole plated glass fibre printed circuits.

Sound Quality

Prompted by the moderately narrower off axis behaviour of the mid/bass unit, I planned to work in two regions of my large 'L' shaped room, firstly the more usual 16 foot wide window space, and then the 27 foot wide wall and book case region opposite. I'd anticipated that the greater distance to the potentially reflecting sidewalls of the latter space could be an advantage, and so it was.

In the smaller aperture Borg worked well enough for me to compile substantial comments, and explore exact angling, also tilt (as already mentioned, the dispersion pattern of the tweeter makes this speaker more than a tad sensitive the listener's ear-height) and finally the spiking and tone control settings.

The Mundorf-Fink AMT air motion transformer 'ribbon' high frequency element, 90 by 26mm, has an inbuilt protective grille. The generous radiating area enables the required lower crossover point of 1.6kHz, to better match the larger than usual bass-mid unit.

Manufacturers specifications

Frequency range - 6dB	41Hz-30kHz
Frequency range -10dB	32Hz-35kHz
Average impedance	10 Ohm
Minimum impedance	6.5 Ohm (at 20kHz)
Sensitivity	87dB SPL at 1m for 2.83Vrms input
Distortion	<0.2% THD at 87dB SPL
Crossover frequency	1600Hz
Bass Unit	High Power 260mm, cast alloy frame with 75mm voice coil
HF Unit	6464 mm² radiating area 90x26mm AMT (Mundorf)
Terminals	High current Mundorf bi-wire connectors for 4mm plugs or spades
Dimensions (HxWxD)	1050 × 300 × 400mm
Weight	52kg each (supplied crated)
Finishes	Choice of standard veneer and paint finishes, matt lacquer, black or grey or any finish to special order
Price	£24,000 per pair

HIFICRITIC Test Results
07/09/2019
FinkTeam Borg

Type	Two-way bass reflex floorstanding speaker
Drive Units	HF: 25x 90mm Heil AMT by Mundorf/Fink LF-MF: 260mm (10.2in.) bonded, doped fibre cone with treated 'accordion' suspension
Crossover frequency	1.6kHz nominal, agreed, slope 24dB/oct
Frequency range (limits) -6dB	33Hz – 30kHz
Typical in-room bass response -6dB	25Hz
Frequency response, reference axis	45Hz - 27kHz (±3dB)
Harmonic distortion	0.1% third harmonic typical, (very low)
Maximum sound output	105dBA in-room, short term
Amplifier power (recommended)	50W - 150W: 8-ohm rating
Nominal Impedance	9Ω (min. 6.7Ω) , easy loading
Sensitivity (2.83V/1m)	86.5dB (close to 87dB specification)

www.finkteam.com
UK sales: www.kogaudio.com

It was clear right away that the Borg could dig deeply into the programme content fed to it. Also, it was analytically sensitive to cables and their arrangement, and to connector tightness, indeed the whole system. It was to easy to hear some issue, suspect this review loudspeaker and find that on investigation that it was the user's fault and not that of the FinkTeam, this mirroring my experience in several Magico reviews.

As the evaluation progressed it was clear that the performance bar had been set very high and that it was up to the reviewer to rise to the occasion. The narrower space option with reflecting sidewalls was clearly non-optimal. It was time to shift the heavy beasts across the room, realign, and spike them.

Designer Karl-Heinz Fink is unusually tall, and I found that I needed to sit on a higher chair to hit the sweet spot. Differential adjustment of the spikes allowed for some helpful down-tilt, thus optimising the sense of presence and air. Also, this 'taller' than usual high frequency unit is more directional than most in the vertical plane, reducing the impact of some room reflections.

Let the fun begin

After some experiment with exact listener and speaker location the fun could begin. This big loudspeaker has a massive, uncompressed, live soundstage quality, with more than a hint of a classical large professional monitor about it. Now unconstrained by those proximate sidewalls the timbre settled down, images sharpened up and dynamics became more expressive.

The soundstage is very good, wide, and well distributed, with most impressive image depth and consistently high resolution, all this combined with fine focus, though move even a little off axis and the effect is clearly diluted. In this respect, at its best, the stereo is reminiscent of that outstanding time aligned linear phase setting for the Kii Three stand mount active – but now with the dynamic power, grip and authority of a powerful, full size studio monitor.

Yet there'ss more: Borg will play very loud, with its excellent clarity and that very fine harmonic integrity held essentially intact. Heavy rock replayed at levels well beyond my longer term endurance was no problem at all.

It did not favour any particular programme type and was as adept on the Lutoslawski *Variations on a theme by Paganini*, here the inestimable two piano version (Argerich, Freire on Philips) as it was with minimalist Philip Glass *Glassworks* piece *Lightning:* here each performer and instrument was rendered most clearly with power, expression and first rate timing, all firmly set in the recorded acoustic. Recordings which present many loudspeakers with some difficulty, heard as harshness, grain or excess brilliance, sailed through the evaluations.

Rock music was seriously impressive, essentially an immersive experience with depth, power and rhythm combined with an uncommon sense of scale, for exemplified by Jacob Collier's *Djesse 1* in high resolution. Here Collier in particular was rendered at near headphone clarity and immediacy.

It took a little while to become adjusted to the room acoustic generated by Borg, but once familiarised you could forget this loudspeaker as a piece of machinery and simply enjoy a vast variety of programme. The hi-res rendering of Dylan's *Man in the Long Black Coat* was near-mesmerising for its limpid transparency, spatial definition, image scale and depth, and that rare sense of being present at the performance. Complex jazz syncopations were excellently portrayed, demanding that tracks be played through to the end.

Borg's bass doesn't draw undue attention, never sounding as if it's working hard, yet it remains highly expressive while also extended, rich and excellently timed. Tuneful low-end simply pours forth, rivalling many systems at nearly double the price: musical performances have fine sense of scale, clearly supported by this highly controlled low frequency foundation. For years I have fought for a better detail, dynamics and timing at low frequencies from loudspeakers – this design really delivers.

In addition, the listening fatigue level was really low, testifying to the intelligent alignments and excellent quality of design, the minimised distortion and hyper-controlled resonances. Even difficult programme was handled with ease: for example the frequently edgy sounding *Mouth Music*, which works really well on the Borg speakers. *Fraioch a Ronaigh* and *Chi Mi Na Morbheanna* were rendered with attack, power and bass dynamics but also with those crystalline Celtic vocals free of 'shout'. This loudspeaker offers natural dynamic scaling, seemingly without headroom limits, inviting you into deeply textured soundstages.

Conclusions

This design is a towering achievement, remarkable resolution in the bass matching that of many other fine loudspeakers in their optimal mid-range. Borg is both shocking and surprising. It has smooth frequency responses, very low distortion and presents an easy load for both amplifiers and cables. Technically accomplished – very low coloration, extended powerful bass, an almost magically sweet treble – it is the sense of musical performance here,

the detail, the speed, the dynamics and the highly expressive timing which so greatly satisfies .

Borg doesn't suit narrower rooms, where it may react badly to close sidewalls, and low seating isn't advised unless you are unusually tall, this entirely due to the AMT tweeter's narrow vertical dispersion characteristic.

All that said, most faults you will hear are those of the system and set-up: careful alignment is essential, as is experimentation with the voicing controls. You should also run the speakers in very well (>200 hours), but the design is very kind to amplifiers and cables, with amps playing louder and sweeter into this loading.

Test Results

Distortion

Commencing at a critical 2kHz, where the tweeter is working hard, here at 1W for 87dB output, the distortion was well down into measurement noise. at better than -76dB, 0.015%, – this rated as simply amazing. At 10kHz the results were still better than 0.03%, and at 20kHz better than 0.1%. It also held to 0.03% for 1kHz predominantly from the bass-mid driver and at 500Hz this latter unit measured 0.12% for 2nd and 0.08% for 3rd harmonic – really excellent. Meanwhile at 150Hz it also measured about 0.15%, which is inaudible, while 3rd harmonic was also superbly controlled, at below 0.04%.

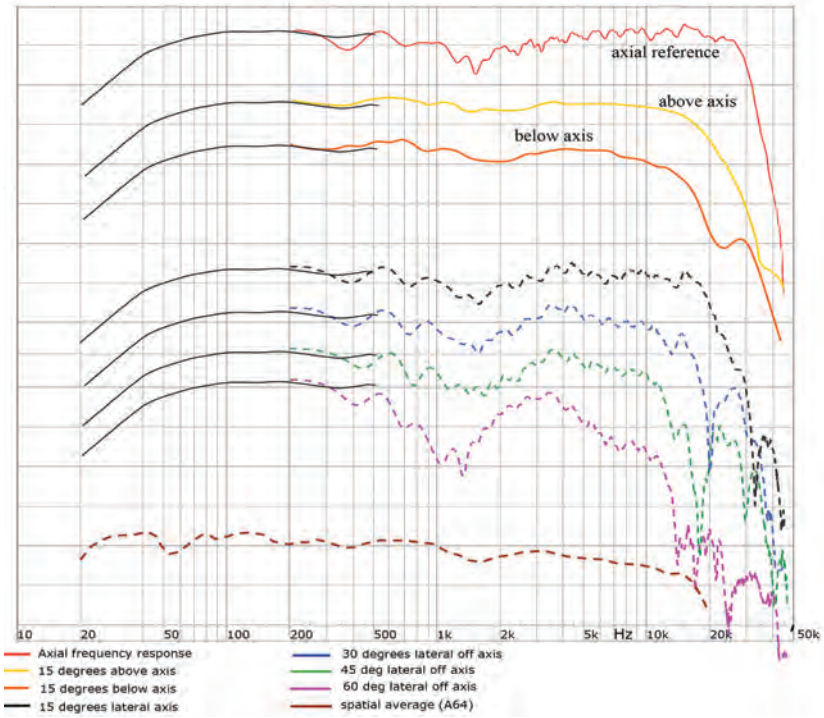
Not unexpectedly, second harmonic was rather higher – at 5% down at 30Hz – in the deep bass, although again in practice this will be inaudible, while 3rd harmonic, potentially sounding 'harmonicky' and nasal if large enough, was amazingly low at 0.15%, this very deep powerful bass tone sounding quite pure. For the midband, at rather higher power, a representative result for 5 watts (and this is loud!), tested at 700Hz, distortion read just 0.03% for 2nd with vanishingly little 3rd (and no other higher order products)– this once again is first class.

Checked for maximum power handling at lower frequencies, the speaker would take a massive 28.5V sinewave down to a low 27Hz (about 100W RMS, 104dB SPL) before noticeable overload was observed. This is a very well-engineered high power, low distortion loudspeaker promising minimal listening fatigue, and this helps to confirm the 200W rating for speech and music.

Frequency Responses

As indicated from the auditioning, the output on the vertical axis is certainly more critical than usual, so a listeners' seated ear height really matters. On axis at 1m the mid-point between woofer and tweeter shows a mild 3dB dip, right on the 1.6kHz crossover

Fink Team BORG: Frequency Responses 86.5dB/W
Sensitivity: True 8ohm Loading



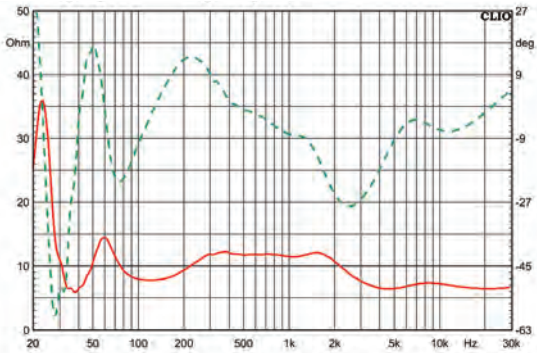
point. At 10 degrees above axis that dip is filled in, while below axis the dip widens. So, your ear height should be just a little below the tweeter and not at the customary mid-point between the two drivers. Above axis, the output extends to 20kHz -6dB. Below axis, we have a more extreme -10dB at that high frequency. This behaviour is due to the sheer height of the 90mm ribbon tweeter element.

On my usual, 'optimal' 7.5 degree lateral off axis, the response measures 45Hz to 20kHz +/2dB, a fine result, while this hi-res bandwidth compatible tweeter actually extends to 33kHz for -3dB on its reference axis. Further off axis laterally, that dip at crossover deepens, owing to the naturally more directional output of the large bass-mid driver, which then leaves the lower midrange a little prominent in energy terms. Therefore, if present, nearby sidewalls will reflect some dominance in the lower mid-range. (also see 60 degree off axis result (pink)) – another reason to avoid using the speakers in narrow spaces.

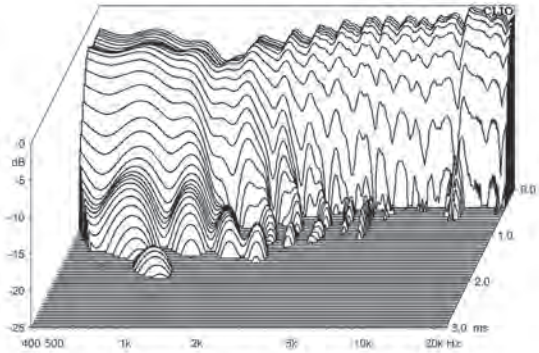
Overall the output is surprisingly well integrated in 1/3 octave analysis, as shown in the room average response, reading a fine +/- 3dB, 33Hz to 10kHz. In my room it also shows a characteristic if rather mild prominence at about 700Hz. Finally, the sensitivity of my sample was just 0.5dB shy of the 87dB/W specification this about average; however, pair matching was excellent.

At heart of FinkTeam HQ in Essen: Karl-Heinz Fink at his desk, surrounbded by his interests, including guitars – lots of guitars! – along with effects unitsand other audio devices. There's usually the odd vintage camrea lens, too

BORG Impedance Loading: Frequency and Phase - 8 ohms Nominal



BORG Time Frequency Analysis, CSD Waterfall Display



Impedance

This system is notably easy to drive, rated at a true 8 ohms and not falling below 6.5 ohms. The accompanying phase angle, describing the reactive content was also moderate. The port was tuned to a low 39.5Hz, with secondary port resonances held to -15dB (e.g. 430Hz) or better.

Energy decay

The waterfall display of resonance behaviour revealed a stably decaying field over frequency, well integrated and very consistent save a tiny glitch at about 16kHz, which will be harmless: a fine result.

And finally, those 'tone' controls worked precisely as claimed.

Where Borg began: the original FinkTeam speaker, now in WM-4 version, on demosntration earlier in 2019 with Marantz electronics. The model designation comes from the resemblance of the massive speaker to a washing machine

Jon Honeyball on Borg

Real hard technical innovation in speakers is a rarity. There are obvious landmarks, from the work done by the BBC, through Peter Walker and electrostatics, to the work of Laurie Fincham at KEF with the Reference series. More recently, there's been Magico with its work on computer-based modelling of its speaker systems, constructed out of complex metal fabrications.

Elsewhere, there is a disturbing amount of 'man in a shed' poking around. One well-known designer recently told me that he doesn't bother taking measurements, relying entirely on his ears. Which is fine, up to a point: I would never claim that measurements alone are the answer to all things. But ignoring them means moving away from engineering to a purely faith-based solution, where the designer believes their product to be working well.

If one thing ties the aforementioned landmarks together, it is the use of the very best measurement technology at the time, to learn as much as possible about what is actually happening.

Today, there is a wide range of tech available, from Audio Precision/Audiomatica measurement through to Magico's use of FIR analysis, and Klippel's laser sensors for precise measurement and modelling of vibration, both of drive units and casework. No-one would claim that this tech is either cheap or easy to use – enormous technical understanding is required to even get you started, let alone make significant gains from its use – so it's no surprise that 'man in shed' prefers the less complex, cheaper route.

As a result, significant improvement in loudspeakers is somewhat rare, with the majority of design improvement being well-intentioned poking in the dark. That applies to even well-known larger vendors with significant R&D teams, unfortunately.

Karl-Heinz Fink and his development team don't shy away from the technical measurement, diving into it with both feet. Their use of the Klippel laser sensor, for example, is notable, but the hard science is not at the expense of listening.

What to say about Borg? It's the best speaker I have ever heard. Period. And although the cabinet and driver design is extremely clever, it is the crossover design that really impresses, simply because it is utterly inaudible. Fink understands the relationship between the crossover and the drive units, and has created something where there is no discernible grunge or noise or distortion at all in that combination.

One of the major reasons given for running active speakers is to get rid of that nasty grainy congested fog that permeates almost all passive loudspeakers. The removal of the passive crossover is usually such a revelation simply because the passive item is so mediocre. The fingerprint of the change is so obvious, so breathtakingly clear that you never want to go back.

However, I can't see any particular reason to want an active version of Borg, simply because the crossover isn't audible. At all. Ever.

"It's the best speaker I have ever heard. Period. And although the cabinet and driver design is extremely clever, it is the crossover design that really impresses, simply because it is utterly inaudible"

This speaker has such depth of clarity at all frequencies that you simply hear new things that you didn't know were there in the performance. It can be positively caned to high SPL levels, and doesn't care: congestion doesn't start creeping in. And the near-8ohm load is entirely benign and easy, so no need for a monstrous power amp here: I bet it could provide party levels from a 13Watt Naim Nait 1.

I could talk about the frequency response, the balance, the detail, coherence, tune-playing and all of those items. Borg matches or exceeds every best-in-class speaker out there. I could glibly state it has the clarity of a Quad Electrostatic in the mid range. The drive and tune-playing of Active Naim DBLs. The sweetness and clarity on strings and percussion of the best tweeter you have ever heard. Voice reproduction that betters anything ever made by Spendor or the other BBC related designs.

Karl-Heinz Fink and his team have done this by applying current tech to expert listening. This is what we should be getting in 2019: it's time for 'man in a shed' be recognised for what he is – an enthusiastic amateur who is out of his depth.

Sound Stage

KARL-HEINZ FINK

WE OFFER THIS PAGE AS A PLATFORM FOR THOSE IN THE HI-FI INDUSTRY WITH SOMETHING TO SAY: AS WE REACH THE END OF THE 'TWENTY-TEENS', LOUDSPEAKER DESIGNER **KARL-HEINZ FINK** SUGGESTS THERE'S STILL A PLACE FOR WHAT SOME WOULD SUGGEST IS OUTMODED TECHNOLOGY

Some weeks ago somebody wrote on an Instagram post regarding a recent passive loudspeaker I had designed, commenting that my concept could have been designed 30 years ago as it employs old fashioned obsolete technology.

This set me thinking, because the author produces an active speaker with DSP crossover and six Class-D amplifiers. I sensed that he was very proud, as he considered his design superior to everything that had been developed in the past. So, is a passive speaker only for old guys like myself, and active conceptions with lots of DSP functionality truly the future of High-End?

I didn't need to think long, because I knew the answer - no, a passive speaker is still the best compromise and gives maximum freedom for creating a good-sounding system. I'm not saying digital crossovers with a DSP and Class-D amplifiers can't work: at Fink Audio Consulting here in Essen we design numerous such speakers for all sort of applications, which is why I know the limits of the concept. A Class-D amp can sound nice, but takes a lot of effort with component quality and power supplies to make them sound good.

The DSP, or digital signal processor. is the only real variable and you need to program the right, good sounding filters. Believe me, there are many ways to program a filter and all of them sound different. I consider that digital filters are far from being perfected: they may be standard filters every student learns at university, but nobody teaches how the different topologies actually sound. Taken together, you have a mix of components and software, all with differing sound contributions.

If you have ever worked with audio electronics, you know how difficult it is to voice a design. Active speakers are even more complicated, because with multiple amplifiers, plus digital and analogue signals, we have to fight with similar problems now found with computer audio and Ethernet signals. We still don't know why a USB cable or Ethernet cable can 'sound' different – now try to imagine how difficult a task it is to voice a complex digital DSP board with Class-D amps.

Don't assume that passive speakers haven't improved in the last 30 years: nowadays, drive units operate with very low distortion thanks to modern analytical tools such as the Klippel system; enclosure vibration can be controlled in a much better way with the help of modern simulation systems plus laser scanners; and the passive crossover can be emulated on a DSP system while in development without even touching a soldering iron.

There's no need to sit next to the speaker with a box full of components, changing parts one by one during critical auditioning: you can make A/B comparisons in real time for different topologies of a crossover within seconds and monitor the changes in response curve.

Of course, at the end of the day, you also need to play with the sonic signature of the components, do the fine tuning and find the best compromise between sound quality and cost – yes, just like 30 years ago! For all those reasons I consider the performance level of passive speaker systems is now much higher, and you also have the freedom to choose your preferred amplifier, source and cable to create a good-sounding system.

For audio in general, DSP technology active speakers will have a great future, especially for lifestyle designs creating big sound from small systems, or to help your AV system perform better. Unfortunately I don't think I'll make it to another 30 years, but my guess is that even by then true high-end speakers will still be passive. In fact, I'd bet on it.

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